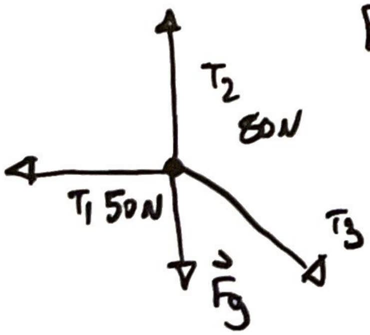
15/15

Ex. 29, 31
Conc Q. 12
Probs 1,12,15,39,42

Taylor Larrechea
10:00-10:50
Phys 131

Ch 6. Problems #1.)

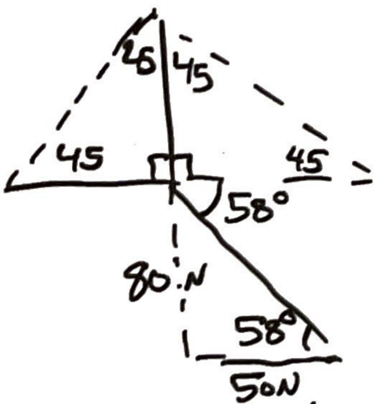


$F = mg$

$\vec{F}$	x	y
T_1	-50N	0N
T_2	0N	80N
$\vec{F}_g$	0N	0N

$\sum F_x = 0 = -T_1 + T_3 \cos\theta$

$\sum F_y = 0 = T_2 - T_3 \sin\theta$



$T_1 = T_3 \cos\theta$

$T_2 = T_3 \sin\theta$

$\tan\theta = \frac{80\,N}{50\,N}$

$\tan\theta = 8/5\,N$

$\theta = \tan^{-1}(8/5\,N)$

$\theta = 58°$

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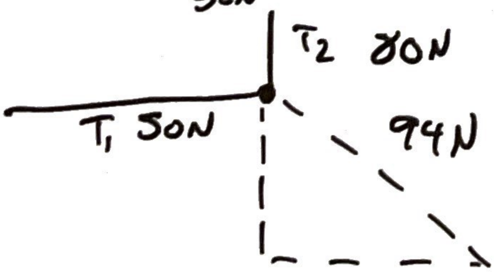


$T_3x = \frac{T_1}{\cos\theta} = \frac{50N}{\cos 58}$

$T_3y = \frac{T_2}{\sin\theta} = \frac{80N}{\sin 58}$

$T_3x = 94\,N$

$T_3y = 94\,N$

94 N, 58° below the horizontal

#12.)

M=50 kg

a.) F=ma M= 50 kg

a=0 m/s² because it is at rest

F= 50 kg (0)

F= 0

$\boxed{F = 0N}$

b.) F=ma M= 50 kg

F=50 kg (0 m/s²) a= 0 m/s² because it is at a constant velocity

F=0

$\boxed{F = 0N}$

C.) F=ma a= 5.0 m/s² M= 50 kg

V = 5.0 m/s

F= 50 kg (5.0 m/s²)

$\boxed{F = 250\ N}$

F= 250 N

15.) M= 8.0 x 10⁴ kg F=1200 KN t_0=0 s t_1=20 s

12 = km

1200 KN

F= ma

1200 KN = 8.0 x 10⁴ a

a= 15 m/s²

$a = \frac{1200\ Kn}{8.0 \times 10^4}$

t_0=0 s	t_1=20 s
x_0=0 m	x_1=12 km
y_0=	y_1=
V_{0x}=0 m/s	V_{1x}=300 m/s
V_{0y}=	V_{1y}=
a_y=	a_{1y}=
a_x=15 m/s²	a_{1x}=

$V_1 = V_0 + a_x \Delta t$

$V_1 = 0\,m/s + 15_{m/s^2}(20s)$

$V_1 = 300\ m/s$

$V_{2(0)} = 300\,m/s$

$\Delta x = 12{,}000\ m$

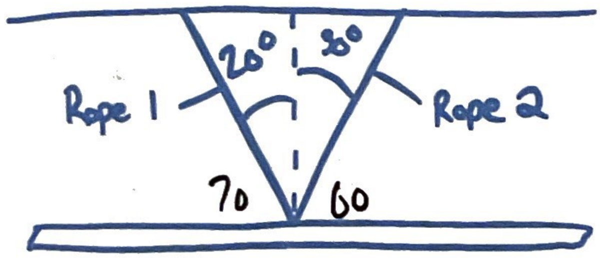
$x_1 = x_0 + v_0 \Delta t + \frac{1}{2} a_x \Delta t^2$

$12{,}000_m = 0m + 300\,m/s\,\Delta t$

$\frac{12{,}000}{300} = \Delta t \qquad \Delta t = 40s$

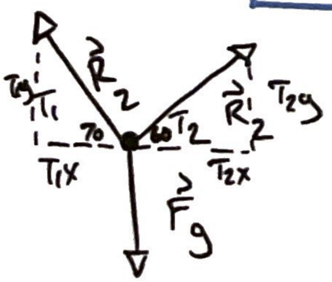
$\boxed{t = 40 \text{ seconds}}$

#39.)



$m = 1000\ Kg$

$\theta_1 = 70° \quad \theta_2 = 60°$



$F = mg$

$\sum F_x = 0 = -T_1 \cos\theta + T_2 \cos\theta$

$\sum F_y = 0 = T_1 \sin\theta + T_2 \sin\theta - mg$

$0 = -T_1 \cos 70 + T_2 \cos 60$

$T_1 \cos 70 = T_2 \cos 60$

$T_1 = \frac{T_2 \cos 60}{\cos 70}$

$1000\,Kg \cdot 9.8\,m/s^2$

$-9{,}800.\ m/s^2$

$0 = \frac{T_2 \cos 60}{\cos 70} \sin 70 + T_2 \sin 60 - 9800N$

$0 = T_2 1.5 \cdot 0.94 + T_2 0.87 - 9{,}800N$

$0 = T_2 2.28 - 9{,}800N$

$-T_2 2.28 = -9{,}800N$

$T_1 = \frac{4{,}298.25 \cos 60}{\cos 70}$

$T_1 = 6{,}283.62$

Rope 1 Tension
6,283.62 N
Rope 2 Tension
4,298.25 N

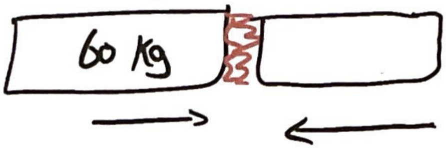
$+T_2 = \frac{9,800}{2.28}$

$T_2 = 4,298.25$

#42.)

#42.a

15 m/s



$m = 60\,kg$

$V_1 = 15\,m/s$

$t_0 = 0s$ $\quad t_1 =$

$x_0 = 0m$ $\quad x_1 = 1m$

$V_{0x} = 15 m/s$ $\quad V_{1x} = 0 m/s$

$a_x = -112.5\, m/s^2$

$V_{1x}^2 = V_{0x}^2 + 2a\Delta x$

$(0 m/s)^2 = (15 m/s)^2 + 2a(1m)$

$0 m/s = 225 m^2/s^2 + 2m\,a$

$-225 m^2/s^2 = 2m\,a$

$\frac{-225\, m^2/s^2}{2m} = a$

$-112.5 m/s^2 = a_x$

Force : $F = ma$

F is force
m is mass
a is acceleration

$m = 60 kg$
$a = -112.5 m/s^2$

$F = 60\,kg(-112.5 m/s^2)$

$F = -6750\,N$

$F = 6750\,N$

$F_{net} = 6750\,N$
acted on the person

#42.b

$V_{1x}^2 = V_{0x}^2 + 2a\Delta x$

$(0 m/s)^2 = (15 m/s)^2 + 2a(0.005m)$

$0 m^2/s^2 = 225 m^2/s^2 + 2a(0.005m)$

$-225 m^2/s^2 = 2a(0.005m)$

$\frac{-225 m^2/s^2}{2(0.005m)} = a$

$t_0 = 0s$ $\quad t_1 =$

$x_0 = 0m$ $\quad x_1 = 0.005$

$V_{0x} = 15 m/s$ $\quad V_{1x} = 0 m/s$

$a_x =$ $\quad a_x =$

$a = -22,500\, m/s^2$

$F = ma$

$m = 60 kg$

$a = -22,500 m/s^2$

$F = 60\,kg(-22,500\, m/s^2)$

$F = -1,350,000\,N$

$F = 1,350,000\,N$

Force of 1,350,000 N

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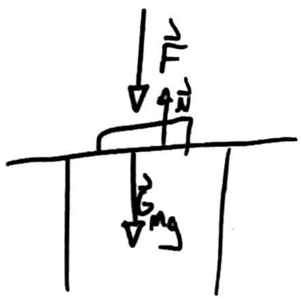
Chapter 6 Concept Questions

#12.) $\vec{N} = F + mg$

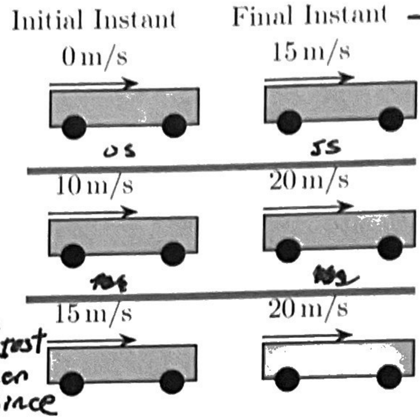
The normal force on the book is larger than mg.



Taylor Larrechea
10:00 - 10:50

29 Moving carts

Three identical carts move horizontally along tracks. Their speeds at two instants 5.0 s apart are indicated. Let F_A be the magnitude of the force acting on A during this interval, F_B be the magnitude of the force acting on B, etc, ... Which of the following is true? Explain your answer.



$\frac{15-0}{5-0} = 3\,m/s^2$

$\frac{20-10}{5-0} = 2\,m/s^2$

$\frac{20-15}{5-0} = 1\,m/s^2$

i) $F_A > F_B > F_C$.

ii) $F_B = F_C > F_A$.

iii) $F_B = F_C < F_A$.

iv) $F_A = F_B = F_C \neq 0$

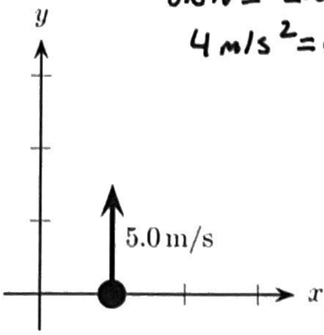
This is because the mass of the carts are the same but A has the greatest acceleration and then B and then C. Since $F = m(a)$, the cart with the greatest acceleration would have the greatest force.

30 Pushing carts

Zog and Geraldine (his wife) each push a cart along a horizontal surface where friction is negligible. Both carts are initially at rest. Zog takes the cart with mass 25 kg and exerts a force of 400 N on it force for a period of 4.0 s and he then collapses and stops pushing. Geraldine has to push a cart of mass 50 kg and she is also able to exert a force of 400 N on it. Geraldine claims that it is possible for the speed of her cart to eventually reach the speed of Zog's cart. Is this true? Explain your answer.

31 Forces and two dimensional motion

At one moment a 2.0 kg rock slides along a horizontal surface. At the moment that it passes the $x = 1.0\,\mathrm{m}, y = 0.0\,\mathrm{m}$ mark it is moving with the illustrated velocity. For the next 4.0 s a constant force $8.0\,\mathrm{N}\hat{\imath}$ acts on the rock.



$F = ma$

$8.0\,N = 2.0\,kg\ a$

$4\,m/s^2 = a$

$t_0 = 0s$ $\quad t_1 = 4s$

$x_0 = 1.0m$ $\quad x_1 = 29m$

$v_{0x} = 5.0 m/s$ $\quad v_{1x} = 21\,m/s$

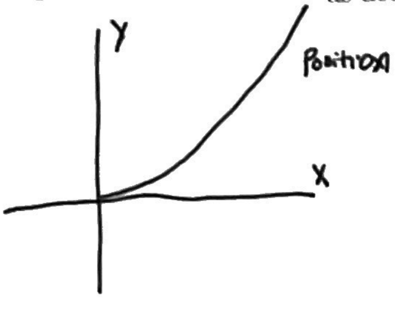
$a_x = 4\,m/s^2$ $\quad a_x = 4\,m/s^2$

$a_y = 0$

a) Determine it position and velocity at the instant 4.0 s later.

Position
$x_1 = 29M$
Velocity
$v_1 = 21\,m/s$

b) Describe and sketch the trajectory of the particle while the force acts on it as accurately as possible.



This trajectory function is not linear and curves up-ward because the velocity is changing every second at a rate $4\,m/s^2$. This means the function of position changes rapidly due to velocities increasing amount.

$x_1 = x_0 + v_{0x}\Delta t + \frac{1}{2} a_x \Delta t^2$

$x_1 = 1m + 5.0m/s(4s) + 2m/s^2(4s)^2$

$x_1 = 1m + 20m + 8M$

$x_1 = 29M$

$v_{1x} = v_{0x} + a_x \Delta t$

$v_{1x} = 5.0m/s + 4.0m/s^2(4s)$

$v_{1x} = 5.0\,m/s + 16\,m/s$

$v_{1x} = 21\,m/s$